in the range 0.8 to 0.9 μm where ALGaAs lasers and LEDs have their emission lines. Future operating wavelengths may shift to the 1.1 to 1.6 μm spectral region where optical fibers have lower optical loss and minimum material dispersion. Semiconductor devices in accordance with the present teaching should have ideal characteristics in this spectral region and a sufficient bandwidth or speed of response to accommodate high information rates.

Furthermore, semiconductor devices in accordance with the present teaching are essentially low noise devices or devices which can operate with a high signal to noise ratio which again makes them well suited to use as detectors in optical communication systems.

Finally, it should be pointed out that the characteristic of FIG. **10***a* or FIGS. **13** and **14** means that the associated devices can be used to analyse the wavelength of detected radiation by scanning the reverse bias across a range of values and mathematically analysing the resultant photocurrents.

We claim:

1. A semiconductor detector for electromagnetic radiation or particles, the detector comprising a semi-insulating substrate, a first layer deposited thereon and having one of n-type and p-type conductivity, a plurality of layers of alternating p and n conductivity types deposited in series on said first layer and terminating in an outermost layer, a strongly p-type electrode region which extends through said p-type and n-type layers and defines a first selective electrode, and a strongly n-type electrode region which also extends through said p-type and n-type layers, and which is spaced apart from said strongly p-type region and defines a second selective electrode with said electrodes for imparting a reverse bias voltage across said layers; wherein said detector is a homogenous semiconductor, characterized by a bulk semiconductor band gap energy and having real space energy bands and having space charge induced periodic modulating of said energy bands leading to confinement of electrons and holes in alternate layers, wherein the n-type and p-type layers other than said first layer and said outermost layer have substantially identical thickness and doping concentrations; wherein said thickness of said n-type and p-type layers other than said first layer and said outermost layer is nominally equal to 500 Å or less; wherein said first layer and said outermost layer are of the same conductivity type and have a thickness substantially equal to one half of the thickness of each of the other layers; wherein said first layer and said outermost layer have a doping concentration of the other layers; wherein the variation in the value of the product for each layer, other than said first layer and said outermost layer, of the respective doping concentration times the respective layer thickness does not exceed 0.5%; wherein the total number of layers of alternating conductivity types is an odd number; and wherein the doping concentrations are such that said concentrations are substantially depleted at zero reverse bias; whereby a high reverse bias can be applied to the device thereby tilting the real spaced energy bands of the layers by the resulting electric field to facilitate the detection of radiation having energy less than the bandgap energy of the bulk semiconductor.

2. A semiconductor detector in accordance with claim **1**, wherein said odd number lies between 9 and 51, with said total number of layers having a minimum total thickness of 1 micron.

3. A semiconductor detector in accordance with claim **1**, wherein the n-type and p-type layers are gallium arsenide with suitable dopants; and wherein cladding layers, comprising the first layer and the outermost layer, are of n-type conductivity.

4. A semiconductor detector in accordance with claim **1**, characterized in that the n-type and p-type layers are silicon with suitable dopants.

5. A semiconductor detector in accordance with claim **1**, characterized in that the n- and p-type layers are indium gallium arsenide.

6. A semiconductor detector in accordance with claim **1**, wherein layers of intrinsic material are provided between the alternate layers of different conductivity types, but not outside of said first layer and said outermost layer.

7. A semiconductor detector in accordance with claim **6**, wherein the intrinsic material has a thickness of the order of magnitude of 100 Å.

8. A semiconductor device in accordance with claim **1**, wherein said semi-insulating substrate is of the same material as said p- and n-type layers.

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